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Related Art (56)

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406,892(53,188/64)	79.4.

The following statement is a full description of this invention, including the best method of performing it known to me :

19682/71—4.

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111-1D-13/1/72-15P.C

This invention relates to a process for coating the interior and exterior walls of a cylindrical metal conduit, and more particularly to a process including the step of spraying powdered resins upon a heated surface.

Techniques and apparatus have been proposed by the prior art in attempts to apply a powdered resin coating to conduits in an efficient and economical manner. In general, these proposals have been unduly wasteful of heat and have not resulted in uniform application of a resin.

One proposal of such a nature is disclosed in United States Patent 3,016,875 issued January 16, 1962, of which the instant invention is an improvement thereover. As disclosed in this patent, the method of coating conduits is to heat the conduit to a predetermined temperature, prime the interior walls thereof, spray onto the interior walls a powdered resin, prime the exterior walls of the conduit, coat the exterior walls thereof with a powdered resin and then quench the pipe as by immersion in water. The first difficulty found in such a process is that the applied resin coatings tend to be non-uniform because of the inherent irregularities resulting in the application of a powdered material to a rotating surface. The process of the instant invention seeks to obviate the resulting non-uniform applied coating by a separate heating step following the application of the resin material. Another disadvantage of the method described in Patent No. 3,016,875, that is obviated by the instant invention, is the unnecessary loss of thermal energy resulting from the exposure of the treated conduit to the atmosphere after heating and before the priming and coating steps are completed. This undue cooling of the treated conduit is substantially obviated in the conduct of the instant invention by priming the desired surfaces prior to heating and by simultaneously coating the conduit immediately after heating.

The primary object of the instant invention is to provide a process of coating conduits with a powdered resin material which results in a uniformly applied coating.

Another object of the instant invention is to provide a process of

coating conduits which utilizes the least possible amount of thermal energy.

A further object of the instant invention is to provide a process of coating conduits which may be utilized with a wide range of metallic conduit materials, such as iron, steel, galvanized iron, aluminum or the like.

A more specific object of this invention is to provide a process of coating conduits which includes, in sequence, the steps of priming selected surfaces of the conduit, heating the conduit, and spraying onto the selected surfaces a powdered resin material.

Another more specific object of this invention is to provide a method of coating a metallic conduit with a uniform resin coating which includes, in sequence, the steps of heating the conduit, applying to selected surfaces of the conduit a powdered resin material and then reheating the conduit.

Other objects and advantages of the instant invention reside in the combinations and arrangements of manipulative steps, all as will be more fully pointed out hereinafter and disclosed in the accompanying drawing wherein there is shown a preferred embodiment for carrying out the instant inventive method.

IN THE DRAWINGS:

Figure 1 is an overall organizational view of the apparatus used in the performance of the instant invention;

Figure 2 is a composite view of a cleaning and priming device used to prepare a tubular metallic conduit for coating;

Figure 3 is an end elevational view of a device for heating a metallic conduit and applying a powdered resin to the conduit heated; and

Figure 4 is a view representative of one manner of quenching a heated conduit after coating.

Referring now to the drawing in detail, wherein like reference characters designate like elements throughout the several views thereof, there is indicated generally at 10 a device for coating a metallic tubular conduit with a resin whose major components are a cleaning and exterior priming station shown generally at 12, a first heating chamber indicated generally at 14, an exterior resin applicator shown generally at 16, an interior priming and resin

applicator designated generally at 18, a second heating chamber shown generally at 20 and a quenching device shown generally at 22.

The first step of the process of the instant invention is to prepare a metallic conduit 24 for coating, which may be performed by an interior cleaning device (not shown) including rotating wire brushes and a pressurized air delivery means to remove scale, rust or the like from the interior of conduit 24. This step may be done while conduits 24 are stacked in a pipe yard as by a mechanized vehicle having a reciprocable and rotatable wire brush and air delivery means although it may be done while conduit 24 is being externally cleaned as explained hereinafter.

A cleaning operation is preferably performed on the exterior of conduit 24 by a cleaning device 26 including rotating wire brushes 28 at station 12. A pressurized air delivery tube 30 is positioned adjacent cleaning device 26 to blow loosened rust, scale or the like into a suction hose 32. After conduit 24 is cleaned in such a manner, it passes through an external priming device 34 from which primer, such as Corvel VCB (Registered Trade Mark), which may be obtained from the Polymer Corporation, is dripped thereon and spread in an even manner by a plurality of rotating felt pads 36.

A motorized cart (not shown) preferably travelling on a set of tracks (not shown) grasps conduit 24 with a plurality of clamps for moving it through first heating chamber 14 having a length of about 18 feet. Interior applicator 18 is mounted parallel to the path of the motorized cart, passes through the rotating drum thereof, and constitutes an outer conduit 38 and an inner concentric conduit 40 between which resides a moving body of coolant fluid. Conduit 40 carries a stream of powdered plastic resin such as Corvel VCB-1325-Orange-2131 which is a polyvinyl chloride made by the Polymer Corporation, entrained in air and has provided on the end thereof a hollow shaft motor for dispersing the powdered resin within conduit 24 as more fully explained hereinafter. Interior applicator 18 is mounted on the motorized cart and is about 75 feet long and is positioned interiorly of conduit 24 before it is placed in first heating chamber 14. Chamber 14 and conduit 24 are

heated by hot air at about 600° F delivered through a multiplicity of air ducts 42. The mechanized cart is provided with a device for rotating conduit 24 from 10 to 20 rpm and has a linear speed of about eight feet per minute when delivering conduit 24 through first heating chamber 14. Using these perimeters, conduit 24 will exit from heating chamber 14 at a temperature of 525° F plus or minus 25° F.

Since interior applicator 18 is much longer than conduit 24 and heating chamber 14, it is not positioned within chamber 14 during the heating of conduit 24. As soon as the leading end of conduit 24 exits from chamber 14, a hollow shaft motor on the end of inner tube 40 starts to rotate at a speed of about 3000 rpm. A slinger tube on the end of this motor shaft then throws a powdered plastic resin-air mixture against the interior of the hot pipe where it liquefies and adheres.

Simultaneously with the interior coating of conduit 24, a set of spreaders 16 adjacent, and preferably below, conduit 24 applies an even layer of powdered resin material on the exterior surface thereof. Since conduits 24 are being rotated and are quite hot, the powdered resin so applied will provide a moderately even plastic resin coating.

Many difficulties have arisen from the use of conduits coated in accordance with the previously discussed process, one of which is the frictional losses resulting from a fluid travelling within such a coated conduit. An uncoated conduit has a so-called "efficiency factor" of about .92 to about .96 which may be improved by periodic cleaning. The utilization of resin coated conduits was initially calculated to be in excess of .99. This has not generally been achieved in practice with coating processes of the type hereinbefore described, one reason being that the connecting together of adjacent conduits results in a roughened area which cannot be wholly obviated by present techniques. Another reason for the failure to achieve calculated results is that the friction factors of laboratory applied resins have been more desirable than those achieved in practice.

In an attempt to partially obviate this latter disadvantage, coated

conduit 24 is moved through a second heating chamber 20 immediately after the powdered plastic resin coatings have been applied by exterior and interior applicators 16, 18 and the resin material has had a few moments in which to liquefy and distribute. Second heating chamber 20 is supplied with hot air at a temperature of about 600° F through a series of hot air ducts 44 in much the same manner that heating chamber 14 is so supplied. Heating chamber 20 is about five feet in length and since conduit 24 is moving at a linear speed of about eight feet per minute, sufficient heat will be absorbed to resoften and more evenly distribute the applied resin coatings. Since conduit 24 is being rotated by the mechanized cart this will also tend to more evenly distribute the applied resins.

The final step of the instant inventive process is a quenching step to harden the applied coatings so that conduit 24 may be handled by conveyors or the like. Quenching means 22 may be a plurality of water delivery pipes 46 and spray heads 48 or may be a water tank into which conduit 24 is placed. In either event, sufficient coolant is applied to conduit 24 such that a conveyor may receive and handle conduit 24 such that the mechanized cart may release it and secure another conduit for processing.

It should be noted that conduit 24 may be primed within a suitable conventional primer capable of having a plastic resin coating applied thereto, such as may be obtained from the Polymer Corporation. Powdered plastic resins may likewise be obtained from the Polymer Corporation and include such different materials as epoxy, polyethylene, penton and the like.

It will now be seen that there is herein provided an improved coating process for conduits, including all of the advantages of this invention and others, including many advantages of great practical utility and commercial importance.

Since many embodiments may be made of the instant invention, and since many modifications may be made in the embodiments hereinbefore shown and described, it is to be understood that the foregoing is to be interpreted merely as illustrative and not in a limiting sense.

The claims defining the invention are as follows:

1. In a process for coating a wall of a conduit with a powdered resin, wherein the conduit is initially heated to a temperature below its melting point and above the melting point of the resin and the resin is thereafter applied to said conduit wall, the improvement comprising: the step of reheating the conduit to a temperature above the melting point of the resin after the resin has been applied to the conduit.

2. The process of claim 1 further comprising: quenching the conduit after the conduit has been reheated.

3. The process of claim 1 further comprising: priming said conduit wall prior to said initial heating of the conduit.

4. The process of claim 1 further comprising: rotating said conduit during the step of reheating the conduit.

5. The process of claim 1 further comprising: rotating said conduit during the application of the resin to the conduit.

6. The process of claim 1 wherein the conduit is tubular and the resin is applied by being simultaneously sprayed onto exterior and interior walls of the conduit.

7. The process of claim 6 further comprising: rotating the conduit during the application of the resin to the conduit.

8. The process of claim 7 wherein said conduit is heated to a temperature of about 600°F. during said initial heating and during said reheating.

21,011/67

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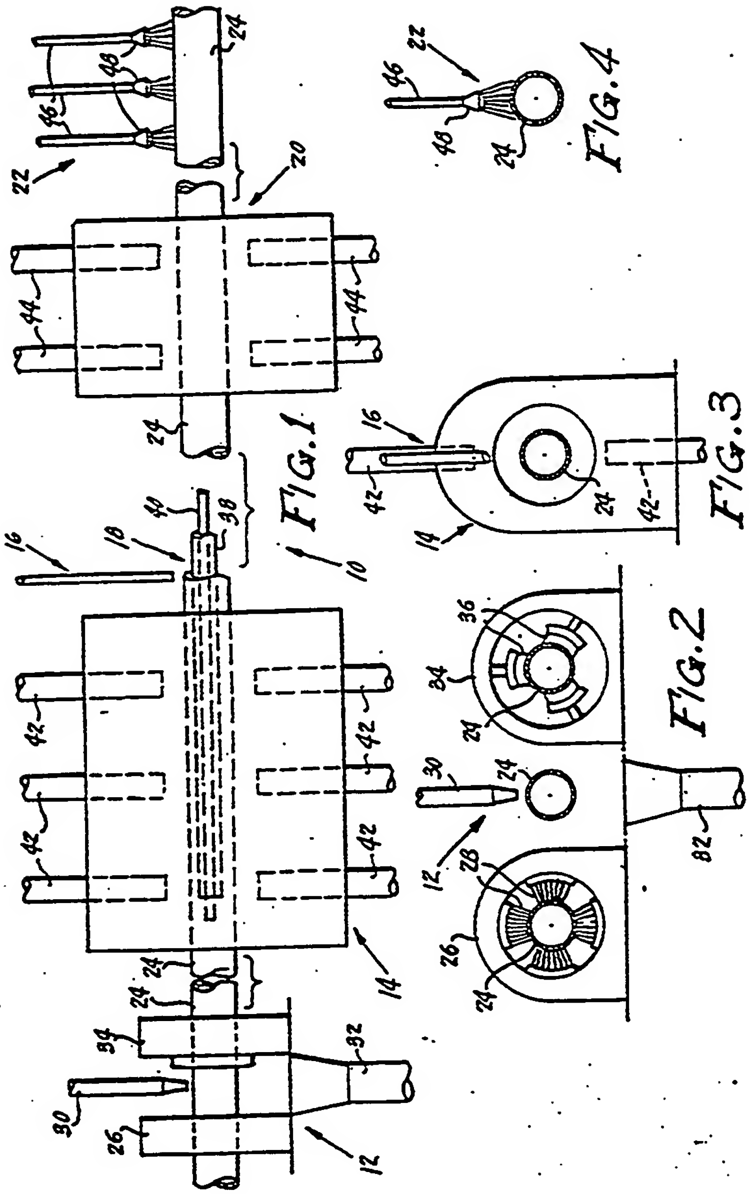

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